

XXI. *On the Genus Aquilaria.* By the late WILLIAM ROXBURGH, M.D., F.L.S. &c.; with Remarks by the late HENRY THOMAS COLEBROOKE, Esq., F.R.S., F.L.S. &c. Communicated by ROBERT BROWN, Esq., D.C.L., F.R.S., President of the Linnean Society.

Read February 18, 1851.

AQUILARIA, Lamarck, Encycl. i. 49. Gen. Pl. ed. Schreb. N. 1753.

DECANDRIA MONOGYNIA.

Sect. *Flowers incomplete.*

GEN. CHAR. Calyx campanulate, 5-cleft. Corol none. Nectary 10-leaved, alternate with the stamina. Capsule superior, 2-celled, 2-valved. Seed solitary. Embryo inverse, without perisperm.

1970. AQUILARIA AGALLOCHA, Roxb. [Fl. Ind. ii. p. 422.] Leaves lanceolar. Umbels solitary, subsessile, between the leaves.

Agallochum, or *Aloe-wood* tree.

Aguru, the Sanscrit name of its precious wood.

Aggur, *Uggor*, *Agor*, &c., its Hindi and Bengali names.

Agha-loo-chee, *Agalugi*, *Agulugin*, *Yelunjooj*, its Arabic names.

Owd and *Owd-hindee* of the Persians.

The tree which I am about to describe (from young ones growing in the Botanic Garden at Calcutta), and which, when of age, produces at least a variety of that ancient and precious aromatic, called Aloe-wood, is a native of the mountainous districts to the east and south-east of Silhet*, the most easterly province of Bengal, in about lat. 24°-25° N.,

* Extract of a letter from Robert Keith Dick, Esq., the Judge and Magistrate at Silhet, to Dr. Roxburgh, dated Silhet, 9th December, 1808:—

“I am much obliged by your affording me the perusal of the accompanying account of the *Aggur* tree; and in returning it, I take the opportunity of giving you such information on that subject as I was able to obtain lately on a short interview with a landholder in this district, who employs his own ryuts in procuring *Aggur* wood in the hills adjoining his property, and is himself concerned in the trade of it; and as it was hastily committed to paper, previous to my reading the enclosure, it may prove so far satisfactory, in as far as some of the particulars nearly correspond.

“The wood is brought here for sale from the country of Kuchar, and from the southern parts of this Zillah, particularly the divisions of Puthureea and Lunglah. The tree is known in the hills here by the Bengal name, *Tuggur*. Its extreme height is from sixty to seventy haths (cubits), and the trunk from two to two and a half haths in diameter. The general height of a full-grown tree is from twenty to thirty haths †. Excepting that part of the wood which is reserved for the extraction of the *Uttur*, the rest is useless,—at least never applied to any purpose in this district. I have not been able to procure any information about the flower, or seed of the tree; they say neither have been seen here. This is perhaps owing to the people going to cut the wood chiefly at one period of the year, viz. the dry season. It is a precarious and tedious business procuring the wood which yields the *Uttur*, as few trees con-

† To the branches must be meant.

where, by various accounts, they attain to a very great size,—as much as about 120 feet in height, with a trunk of above 12 feet in circumference. Accounts from Assam make it still larger. Flowering-time, in its native soil, uncertain; but in this Garden a very healthy young tree, out of several that were sent to it some years ago by Mr. Robert Keith Dick, the Judge and Magistrate at Silhet, was in flower in March and April last, and again in April 1810.

DESC. Trunk (in our young trees) straight, and clothed with thin, smooth, ash-coloured tough bark. Branches nearly erect, with their terminal, bifarious, alternate, extreme twigs recurvate, bark of the branches light grey, with many small ferruginous fissures; young shoots clothed with white, soft, appressed hairs. Wood white, very light, soft and porous. Specimens from large trees in their native soil are also uncommonly soft and light, with a slight tinge of yellow, and not unlike the softest porous deal; every part inodorous, and nearly tasteless. The moisture (for nothing like exudation is found here) scraped from a fresh-cut twig was rubbed on the eye and eyelids of a chicken, without producing any inflammation or apparent irritation. This does not accord with what Father Camellus says of the true *Agallochum* tree, viz. “The bark is filled with virulent, milky juice, so very caustic as to cause blindness if it gets into the eye,” &c. I can well believe the pale milky juice of *Excoecaria Agallochum* very capable of doing injury to tender parts, and probably our reverend traveller may have lighted upon that tree, which was said to yield an inferior sort of *Agallochum*. Leaves alternate, bifarious, short-petioled, lanceolar, firm and smooth, lucid deep green, except while very young, then somewhat sericeous, which is more conspicuous underneath, taper acute pointed; entire waved margins; length from 3 to 6 inches, and from 1 to 2 inches broad. Veins nearly as fine as in *Calophyllum Inophyllum*. Petioles very short ($\frac{1}{6}$ or $\frac{1}{8}$ of an inch), rugose, and a little hairy. Stipules none, except an opposite, oblong, hairy scale or two at the base of the most tender axillary shoots, like those of a gem, or bud. Inflorescence simple, solitary, subsessile, beautiful, small, spherical umbels, at nearly equal distances between or from the leaves (internodes). Flowers numerous (20–40 to the umbel), pedicelled, small, pale greenish yellow, inodorous. Bracts none. Calyx 1-leaved, campanulate, permanent, half 5-cleft; segments

tain any; and such as do, have it very partially distributed in the trunk and branches. The people employed in this business proceed two or three days' journey among the hills, jungles and mountains, and without discrimination cut down the trees as they are found, young, old and withered, but the latter are generally preferred; they then, on the spot, search for the *Aggur*, which is done by chopping off the bark, and into the wood, until they observe dark-coloured veins, yielding the perfume which guides them to the place containing the *Aggur*, and which generally extends but a short way through the centre of the trunk or branch. In this manner they search through the whole tree, and bring away only such pieces as contain the oil, or have the smell of it. In this state there are four denominations, viz.

1st. <i>Ghurkee</i> (sinks)	which sells from 12 to 16 rupees per seer (of 2 lbs.).
2nd. Has no other name than <i>Doim</i>	ditto 6 to 8 ditto
3rd. <i>Simula</i> (floats)	ditto 3 to 4 ditto
4th. <i>Choorum</i> (small pieces, which float)	ditto 1 to 1 $\frac{1}{2}$ ditto

“The tree grows in sandy as well as clayey soils, on plains, and on the sides and tops of the hills; neither root, leaves nor bark yield any *Uttur*. Some trees will produce a maund (80 lbs.) of the four sorts. The oil is obtained by bruising the wood in a mortar, and then infusing it in boiling water, when the *Uttur* collects itself on the surface.”

ovate, obtuse, spreading. Corol none. Nectary of 10, oblong, obtuse, hairy scales, which are inserted into the mouth of the tube of the calyx, alternate with the filaments, slightly incurved, so as to form a dome over the germ, its mouth being shut up with the stigma. Filaments 10, shorter than the nectarial scales, coloured reddish at top. Anthers erect, oval, 2-lobed. Germ superior, ovate, smooth, 2-celled, each cell containing a single oblong ovule, attached to the partition above its middle. Style short and thick. Stigma large, glandular, obscurely 2-lobed. Capsule drupaceous, clavate-turbinate; length rather above an inch, and the diameter about half the length; of a soft fleshy texture, and villous over the surface, like a peach; colour olive-green, its contracted base embraced by the permanent calyx; 2-valved, opening round the apex (like the envelope of the nutmeg); 2-celled, partition opposed to the valves: one of the cells is generally abortive. Seed solitary, oval, with a large, straight, spongy, pointed horn from the base, which is about as long as the body of the seed. Integuments 4. Exterior, while recent, soft and white, when dry, dark brown and villous on the outside. It is a continuation of this envelope which forms the horn of the seed; on the inside a vertical, brown groove, in which the filiform umbilical cord is lodged, which connects the apex of the horn to the top of the partition; second, while recent, thick, and hardened at the base only, which is pointed and projects a little into the spongy horn; when dry, dark brown, smooth, hard and brittle; on its inside a slight groove is also observed, corresponding with that of the exterior integument; third, soft, brown, and rather spongy; fourth, or innermost, a thin pearl-coloured membrane adhering to the embryo. [Note. The last two not easily detected in the fresh seed, but when dry very conspicuous.] Perisperm none. Embryo inverse, when dry very pale yellow. Cotyledons conform to the seed. Plumula 2-lobed. Radicle subrotund, superior.

The foregoing is a faithful description of the tree which blossomed in this Garden in March and April 1809 and 1810. And that of the pericarpium and seed is not only taken from that which the same tree produced, gathered with my own hand, but also from some seeds which Dr. Buchanan sent from Goolparah, on the banks of the Megna or Brachmaputra, to Sir John Royds, who obligingly parted with them to enable me to render my account of this interesting tree more satisfactory; and again in 1810, from Mr. Richard Matthew Smith, of Silhet, gathered from a tree growing in his own garden at that place.

At present it is not possible for me to affirm that this is the tree which produces the real *Calambac* or *Agallochum* of the ancients, but there seems more reason to think it went to the westward from our eastern frontier, than to suppose it was carried from Cochin China, or any other country in the vicinity of China, where it has always been held in the highest estimation. Small quantities are sometimes imported into Calcutta from the eastward; but such is always deemed inferior to that of Silhet.

There is a wonderful agreement between the various but imperfect accounts of the trees said to produce this valuable drug, and that which I have now described and figured.

Lamarek's description of the specimen* presented to him by Sonnerat agrees almost

* *Garo de Malacca*, Lamarek, *Encycl.* i. 49.

exactly with our plant. The inflorescence is only required to confirm their being the same species, or different. Of their belonging to the same genus there can be no doubt*.

Cavanilles describes and gives a figure of the *Garo de Malacca* of Lamarck, in his Seventh Dissertation on the Plants of the Class Monadelphia, page 377. t. 224, under the name *Aquilaria ovata*, which is continued by Willdenow in his edition of the 'Species Plantarum' of Linnæus, vol. ii. p. 629. His description differs little from that of Lamarck, and his figures, so far as they go, agree uncommonly well with our subject.

I have not ventured to quote *Agallochum secundarium* (Rumph. Amb. ii. 34. t. 10), though much inclined to think they are the same. His description and figure of the specimens he received under the name *Agallochum malaccense*, so far as they go, agree as well with our tree as can be expected, and as well as the generality of the figures in that work do with the plants they are intended to represent. We must, however, suppose the fruit inverted in his plate; which is the more excusable, as it was not growing on, or naturally attached to the branch the figure is taken from, but tied to it.

Kæmpfer, that most accurate writer, in his 'Amœnitates Exoticæ,' page 903, gives a figure and description of the small plant of the *Agallochum* tree, which with great difficulty he obtained from distant mountains, under the name *Sinkoo*, both of which agree exactly with some young plants of nearly the same size (lately sent from Goolparah by Dr. Buchanan, and from Silhet by Mr. Smith) now growing in this Garden, even to every one of the plants being uniformly divided into two little branches, which with their leaves have the precise appearance of Kæmpfer's figure.

About the time that Kæmpfer made his voyage to Japan, our countryman, Mr. James Cunningham, was employed by the English East India Company on the coast of China, where he must have seen the fruit of this tree, which he describes so well, viz. "turbinate, villous, size of a yellow *Myrobalan*, with a thick cortex, opening into two, and containing two seeds separated by a partition, with membranaceous appendages (probably what I call the horn), and resting on a five-parted calyx." Until Gærtner's work appeared, this would have been reckoned a full and accurate description of the seed-vessel of my *Aquilaria Agallocha*.

Loureiro's *Ophispermum sinense*, 'Flora Cochinch.' p. 344, is no doubt another species of the same genus, and if he, or his editor, had omitted the words "flos terminalis, solitarius," I should have concluded they were the same; and unreasonable as it may appear, I must also remark, that I think, whoever reads with attention, and compares with this, his account of the nature and production of Aloe-wood in the 'Memorias de Academia Real das Sciencias de Lisboa,' vol. i. p. 402-415, will find a striking similarity in many respects, viz. size and habit of the tree; smoothness and fibrous texture of the bark, of which paper is made in both countries; shape, texture and appearance of the leaves; in

* Since writing the above, Dr. Roxburgh has received living plants, and perfect capsules with their seeds, of the *Garo de Malacca*, from Captain Farquhar, the Governor of Malacca. They are not to be distinguished from some plants of the same size, and seed-vessels of his *Aquilaria Agallocha*, very lately sent to this Garden by Mr. Smith from Silhet, a proof next to positive of their being the same: for positive proof we must wait till the Malacca plants flower, or till specimens in flower, which Captain Farquhar has promised, are procured.





the want of odour and taste in every part thereof, except the drug itself; in no part of the tree being lactescent or poisonous; in the wood being white, light and porous, &c. &c. I place little confidence in his description of the parts of fructification, as he acknowledges, in Willdenow's edition of his 'Flora Cochinchinensis,' to have only once seen a mutilated branch of the tree in flower, which by long carriage had the petals, anthers and stigma much bruised and torn. And if the natives of Cochin China are not more honest than in most other parts of South Asia, they would not scruple to give him the fruit of any other tree for that of his *Aloexylum*. I am therefore not much inclined to give any great degree of credit to the natural character of a plant wrote under such circumstances, and rather think the tree which produces the Aloe-wood of Cochin China, and the *Aggur* from the vicinity of Silhet, are the same.

The tree which furnishes this precious incense is chiefly found in that part of Asia called the Peninsula beyond the Ganges. The mountainous countries to the east and south-east of Silhet, where our tree grows, are fairly within this division, and correspond pretty well with the range given by Loureiro to his *Aloexylum verum* or *Agallochum*, which is some small additional proof of their being the same; and, indeed, through the whole of the above notices, taken from such authors as are within my reach, there runs such an uncommon share of coincidence, as to induce me to believe they all relate to the same identical object. By this belief I must acknowledge my account of my *Amyris Agallocha*, so far as it relates to its yielding *Calambac*, to be erroneous. It is needless to detail the source of the error; suffice it to say that I acknowledge it, and also acknowledge myself to have been much to blame for believing those who gave me the information, which has unfortunately been published, or publishing, in the third volume of my 'Indian Plants.'

EXPLANATION OF THE PLATE.

TAB. XXI.

- Fig. 1. A small branch of *Aquilaria Agallochum*, in flower:—nat. size.
 Fig. 2. One of the flowers laid open, exposing to view the pistillum, part of the nectaries, and stamina (part being removed):—magnified.
 Fig. 3. One of the nectaries between two of the stamina:—magnified.
 Fig. 4. Transverse and vertical sections of the germ:—much magnified.
 Fig. 5. The capsule.
 Fig. 6. The same, opened, exposing one fertile cell, with its seed, and one abortive cell.
 Fig. 7. The entire seed and umbilical cord:
 Fig. 8. The same, with half of the two exterior integuments removed. These four are of the natural size.
 Fig. 9. The seed removed from the two exterior integuments.
 Fig. 10. Transverse section of the same.
 Fig. 11. A vertical section.
 Fig. 12. The plumula and radicle:—much magnified.
 Fig. 13. The two cotyledons.

Remarks by HENRY THOMAS COLEBROOKE, *Esq., F.R.S., F.L.S. &c.*

The information received from Mr. Dick, concerning the manner of collecting the Aloe-wood, corresponds so nearly with other notices on the same subject, as to afford a strong confirmation of their general accuracy.

The following account is by the author of the 'Mekhzen ul adveyeh,' whose near relation to the Nawab Mahammed Reza Khan afforded him opportunities of inquiry, of which he diligently availed himself.

"*Uúd* signifies wood or branch, and emphatically, the wood called *Uúd Hindi*, or, in the Hindi language, *Agar*. It is obtained from a species of tree found in the mountainous country of Jentiya, near Silhet, in the north-east of Bengal*.

"The tree is very lofty, its trunk and branches are generally crooked and rather soft, so that neither clubs and walking staves, nor bowls and platters, can well be made from them, by reason of their softness and crookedness. Besides, the tree is in many parts hollow.

"Until the wood be old and have remained long after being cut down, so that it may decay and rot, it does not acquire its proper fragrance. To accelerate this change, the wood is buried in moist ground, and being afterwards dug up, so much of it as is dark-coloured and of a glossy unctuous appearance, and found upon trial to sink in water, is selected and set apart under the denomination of *gharkí*. Any remaining portions of unmellowed wood are carefully separated from it by means of an iron instrument to obtain the *gharkí* in a pure state. Specimens which sink but partially are termed *nim-gharkí*, or semi-mergent. Those which float are called *semleh*, or dregs, and are the most common but least esteemed.

"This fragrant wood is of various sorts, distinguished by the names of *Hindí*, *Samadúrí*†, *Kumárí*, and *Mandalí*. The *Hindí* is of the darkest colour; the *Samadúrí* has a more unctuous appearance than the Indian sort. The *Kumárí* is of a lighter colour. The *Hindí* (should be *Mandalí*) is the most fragrant of all.

"It is likewise distinguished as *Bari* and *Jabalí* (rustic and mountainous), the latter with black streaks, the former with white; some, however, reverse these characters.

"The *Samadúrí* is named from the country whence it is brought; so is the *Kumárí*‡.

"In medicine, the *Hindí* from Silhet in Bengal, of the quality called *gharkí*, being bitter, fragrant, unctuous, and a little hard, is preferred§, because the Aloe-wood of other places does not equal it in fragrancý and excellence.

"In some recipes and prescriptions, it is directed that crude *úúd* should be taken||.

* The 'Tohfet ul muminín' says, it is a tree which grows in the islands of China and India.

† The 'Tohfet ul muminín' writes this *Samandúrí*.

‡ The varieties of this wood are denominated from the countries which produce them, as *Samandúrí*, *Hindí*, &c.—*Tohfet ul muminín*.

§ The best kind is black, hard, shining, fragrant and bitter, sinking in water. This is the *Hindí*, and the *Kumárí* is of a lighter colour. The *Samandúrí* is more unctuous. The rustic and mountainous varieties of it have white stripes. That which swims in water is bad.—*Tohfet ul muminín*.

|| This direction is to be found also in the recipes of the Greek and Arabian physicians, compiled by Nicolaus Myrepsicus. See Rumphius, ii. 39.